

U.S. EPA's Workshop on SF<sub>6</sub> Emission Reduction Strategies  
April 17-18, 2012



# GLOBAL WARMING, EXTREME WEATHER AND MY JOURNEY

**Stu Ostro**

**Senior Meteorologist**

**Senior Director of Weather Communications**

**The Weather Channel**

Source of all weather maps and graphs:  
NOAA unless o/w indicated

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Channel**

**weather.com**



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# WHAT I'M **NOT** GOING TO DO THIS MORNING

- Try to “indoctrinate” anyone
- Tell anyone what they can emit
- Talk about “cap and trade” or any other legislation

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# A BIT ABOUT STU

- I do not receive funding from the energy industry or environmental organizations
- Nobody at TWC or its parent companies or its advertisers has ever pressured me to change my views on climate change
- I consider myself to be politically independent and have voted for Democrats and Republicans and Libertarians
- I used to be a hard-core global warming “skeptic”

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## THE LIST

# 6 global warming skeptics who changed their minds

**THE WEEK**

POSTED ON SEPTEMBER 1, 2010, AT 2:15 PM

Climate change doubters have just lost one of their leading lights, as writer Bjorn Lomborg calls for a worldwide carbon tax. But he's not the first high-profile defector

### 6. **Stu Ostro**, Weather Channel senior meteorologist

A recent survey found that many meteorologists and TV weathercasters are skeptical (or even "cynical") about anthropogenic global warming (AGW), and Ostro [used to fit in that camp](#). Now he regularly explains the connection between man-made climate change and the extreme weather roiling the world.

**Before quote:** Large swings in temperature "happened long before humans had a chance to influence the environment, [and] typically occurred within a 10-year period, indicating that drastic climate change can occur through natural means, and quickly." (1999)

**After quote:** "When it comes to skepticism about AGW, you could say I have street cred," but "it could be said that I 'converted' and became a 'believer.'" (2010)

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# SKEPTICISM

- Is a fundamental part of the scientific process, and is healthy when in that vein
- Is not constructive when it becomes overwhelming and results in being closed-minded

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# TERMINOLOGY

- Convinced
- Unconvinced

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# I AM NOW CONVINCED

- That something ain't right ...
- ... with the weather, and it's beyond what can be explained by natural variability
- It's happening now, not just 50 or 100 years from now, and it's serious, and important that we understand what's going on

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# IT'S NOT JUST ME ...

It's also my friend Dave  
from college in the 1970s ...

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# IT'S NOT JUST ME ...

It's also my friend Dave  
from college in the 1970s ...

Here he explains his journey from climate skeptic to one of the leading scientific voices warning about the impacts of a warming world, rising oceans, and acidifying seas. Viewers may wish to compare to the similar journey of Weather Channel senior forecaster Stu Ostro.

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# IT'S NOT JUST ME ...

David Titley, "I used to be a climate skeptic"



United States Navy

## Biography

**Rear Admiral David W. Titley**  
**Oceanographer and Navigator of the Navy**  
**Director, Maritime Domain Awareness and Space**

A native of Schenectady, N.Y., Rear Adm. Titley was commissioned through the Naval Reserve Officers Training Commissioning program in 1980.

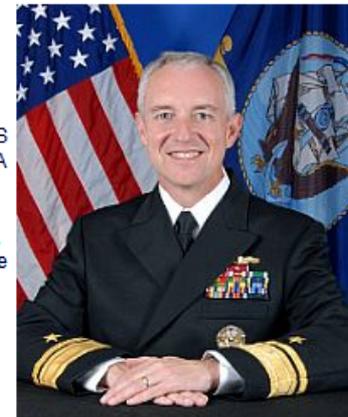
Titley served more than 10 years at sea, including a tour as navigator aboard USS *Farragut* (DDG 37), and tours as oceanographer aboard USS *Belleau Wood* (LHA 3), USS *Carl Vinson* (CVN 70), Carrier Group Six and U.S. 7th Fleet.

Shore tours include serving on the staff of the U.S. Commission on Ocean Policy, and as the senior military assistant to the director of Net Assessment in the Office of the Secretary of Defense.

Titley has commanded the Fleet Numerical Meteorological and Oceanographic Center in Monterey, Calif., and was the first commanding officer of the Naval Oceanography Operations Command. He served his initial flag tour as commander, Naval Meteorology and Oceanography Command.

Education includes a B.S. in Meteorology from the Pennsylvania State University, an M.S. in Meteorology and Physical Oceanography and Ph.D. in Meteorology, both from the Naval Postgraduate School. He attended the Massachusetts Institute of Technology Seminar XXI on Foreign Politics, International Relations and National Interest, and is a fellow of the American Meteorological Society.

In 2009, Titley assumed duties as Oceanographer and Navigator of the Navy and director, Task Force Climate Change. In 2011, he assumed responsibility for Navy Space and Maritime Domain Awareness.



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# STU ENTERS THE KITCHEN ...

**December 29, 2005**



**IT'S TIME TO WAKE UP AND SMELL THE THAWING PERMAFROST!**

[Stu Ostro](#), Senior Meteorologist

**September 27, 2007**

**A CONNECTION BETWEEN GLOBAL WARMING AND WEATHER**

[Stu Ostro](#), Senior Meteorologist

**January 21, 2008**

**UPDATE ON GLOBAL WARMING, WEATHER, AND THE ARCTIC**

[Stu Ostro](#), Senior Meteorologist

**March 29, 2008**

**GLOBAL COOLING?**

[Stu Ostro](#), Senior Meteorologist

**April 18, 2008**

**GLOBAL COOLING! PART DEUX**

[Stu Ostro](#), Senior Meteorologist

**February 2, 2007**

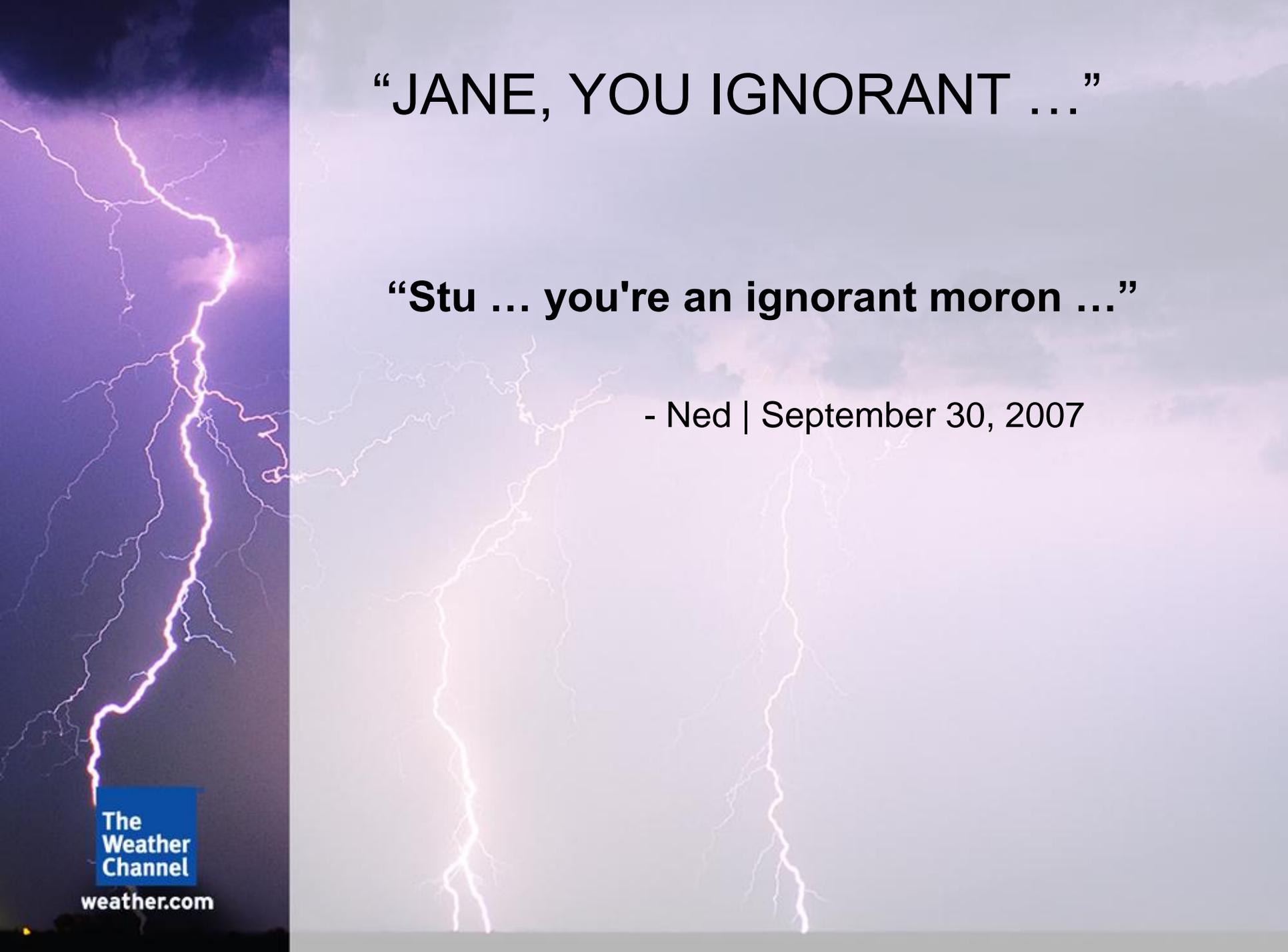
**GETTING HOT IN HERE**

[Stu Ostro](#), Senior Meteorologist



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**“JANE, YOU IGNORANT ...”**

**“Stu ... you're an ignorant moron ...”**

- Ned | September 30, 2007

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# MR. OSTROASS

**Friday, March 19, 2010**

## **Stu Ostro, you're a Chill Shill**

I apologize for my lame subject title, I wanted to borrow Stu's absolutely ridiculous habit of rhyming, or alliterating, combined with his charming ability to repeat Leftist government talking points while miring in his own idiocy. This is not surprising considering weather.com is tied to the government-funded NOAA. Stu wrote a large article on today's weather.com about how this past winter can best be characterized as "relentless." He then spirals off onto a 3 paragraph tangent, huffing and puffing about how despite record snow events and a persistent blocking ridge over Greenland than funneled Arctic air right into the Caribbean, it's actually the 2nd warmest January ever, and that anthropogenic warming is the culprit. Apparently Stu Ostro, the snake oil salesman of meteorology, doesn't want to lose credibility or the one other reader of weather.com besides me. Well, it's kind of funny, because Stu first mentions that the El Nino of 2009-2010 (which I predicted last April) was the 4th strongest on record. Then he squawked about how this winter was the 2nd warmest in some places. Then, he attributed it to man-made factors. Let's review definitions, Mr. Ostroass:

1. El Nino warms the ocean.
2. Air passing over the ocean takes on the temperature of the water beneath it (think 6 months of straight 90 degree weather in Miami), making the air warm.
3. That air blows over America.

So, if it's El Nino's fault for warm air, that would be responsible for the overall warmness of this past winter. NOT HUMANS. Unless billions of boatloads of humans started dumping boiling water into the Pacific Ocean at some point.

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# Mr. Ostroass

his charming ability to repeat Leftist government talking points while miring in his own idiocy.

Apparently Stu Ostro, the snake oil salesman of meteorology, doesn't want to lose credibility or the one other reader of weather.com besides me.

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# Use of social media



**Sensi T Far** Nice try...Stu Ostro is a DISGRACE.. There is NO GLOBAL WARMING... THAT BULL CRAP you tried to pass off as Science at 9 50 pm Wed 1 12 2011 was LAUGHABLE. John Hope must be turning in his grave... Hope AL GORE is happy with you... I guess when you work for NBC, you lose your honesty. lovely...shame on YOU.....You made a FOOL out of yourself.

19 hours ago · Like · Comment

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**Gregory Mitchell Smith** When one is a guest in someone's home they don't soil the place and themselves. Show some respect to Stu, or move on. Time to leave the peanut gallery.

7 hours ago · [Like](#) · [Flag](#)



**Sensi T Far** Hey Greg, I will stand up to any who push a Political Agenda of LIES. If you tried your lines in Army BT, you'd learn about respect. TWC is for the WEATHER. Heidi Cullen started this GARBAGE and NBC continues it. You want to 'instruct' me, get on a plane an visit .We'll see what you got.

6 hours ago · [Like](#) · [Flag](#)

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**Stu Ostro** Hi Sensi,

I come from a background of, like you, being very skeptical about global warming. In fact, statements I've made in the past were featured on the website of Fred Singer, one of the most vehement and prominent global warming skeptics of all time.

[http://www.his.com/~sepp/Archive/NewSEPP/weather\\_climate\\_exte.html](http://www.his.com/~sepp/Archive/NewSEPP/weather_climate_exte.html)

My point of view has changed since then, and what I said on TWC last night was about *\*weather\** not politics, and represents conclusions which I came to *\*independently\** and *\*before\** TWC was partly owned by NBC, and are based on what is being shown by the *\*data\**. <http://tinyurl.com/GWweather-StuOstro>

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**Sensi T Far** Stu, I promise you, I speak for many many people. We HONESTLY just would like the Forecast. Many feel when Solar or Man Made Global warming is brought into a forecast, it is full of Political Agenda's and 'Maybes'. I know you are a very sharp and smart man. Please understand that 99% of people that tune into TWC just want the Forecast.. I am also VERY sorry about the anger I spewwed at you! It was because the Left -Al Gore - garbage is getting on my nerves. Please excuse me and thank you. Sensi T

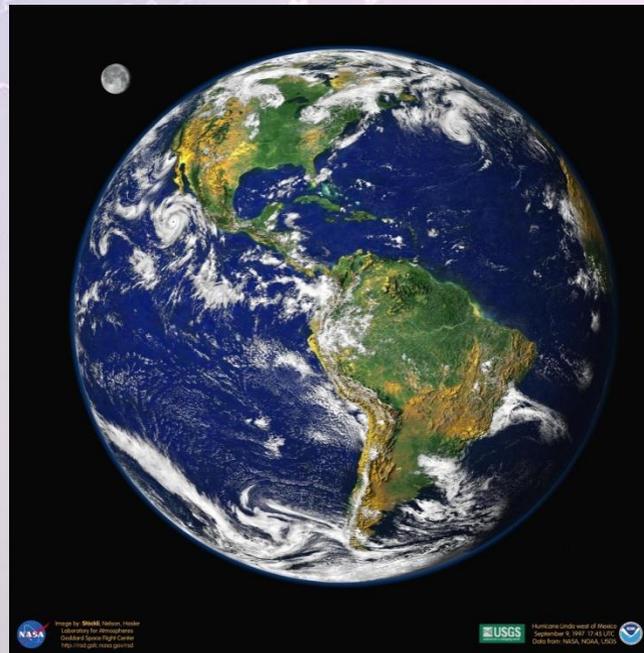
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# THE CHALLENGE

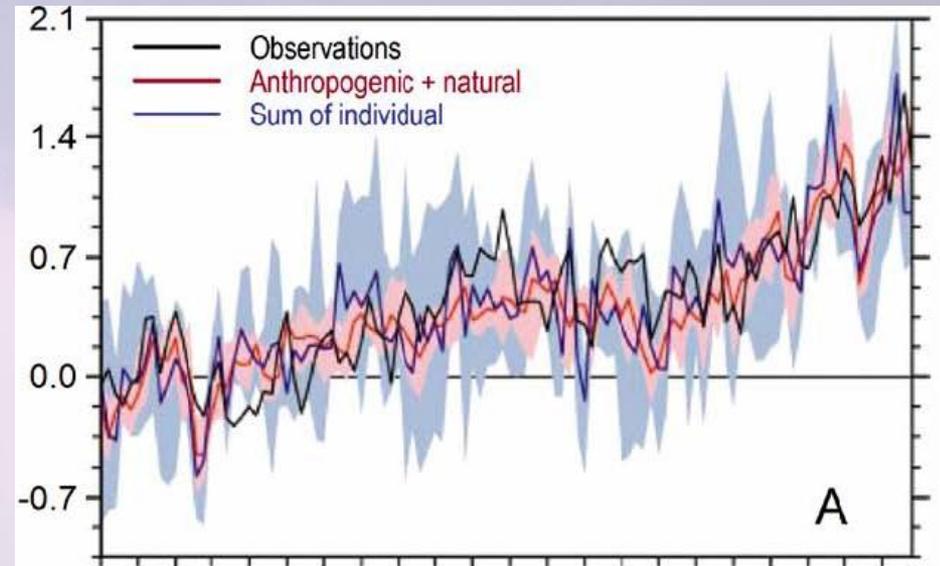
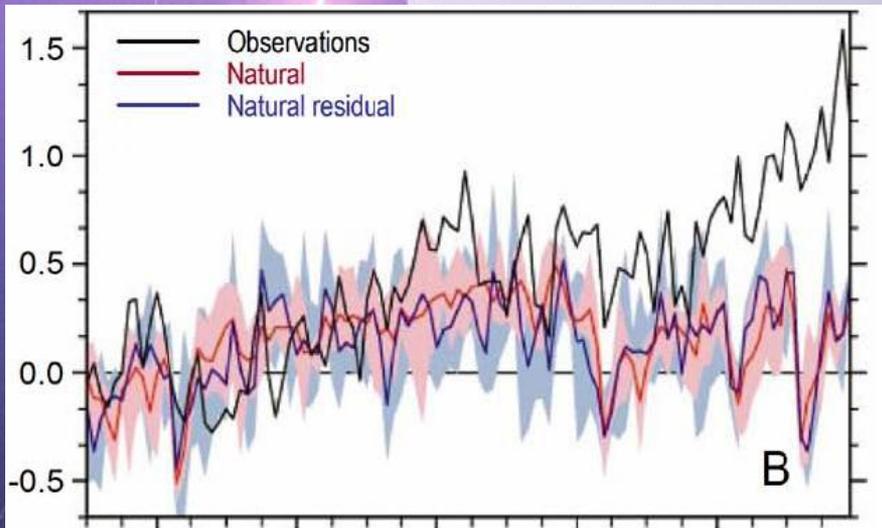
There aren't 2 Earths, one on which to run a control experiment to "prove" the cause(s) of what's happening on ours



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# BUT THE EARTH'S CLIMATE SYSTEM CAN BE MODELED...



Journal of Climate

[Volume 17, Issue 19 \(October 2004\)](#)

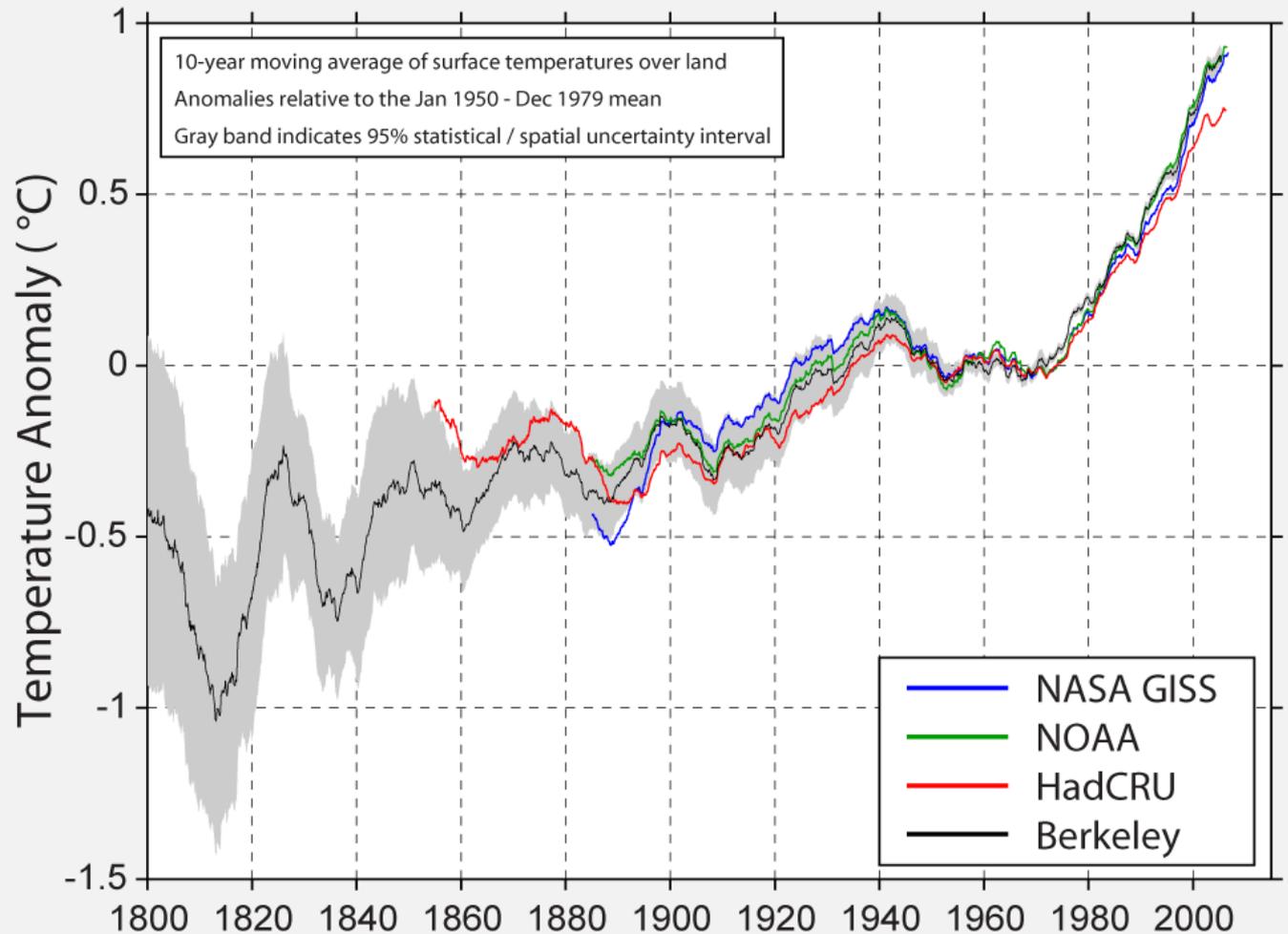
Combinations of Natural and Anthropogenic Forcings in Twentieth-Century Climate

Gerald A. Meehl, Warren M. Washington, Caspar M. Ammann, Julie M. Arblaster, T. M. L. Wigley, and Claudia Tebaldi

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# Decadal Land-Surface Average Temperature



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# CHANGING CLIMATE → CHANGING WEATHER

- The “Ostro Hypothesis”
  - Temperature/precipitation extremes
  - Topsy-turvy stuff
- Other changes in “circulation patterns”
- Arctic sea ice changes → atmosphere overhead/downstream
- More evaporation / water vapor in the air
  - Precipitation extremes, both low & high
- **Tornadoes: seasonal distribution; o/w uncertain**
- Hurricanes: lot of extremes lately, but jury out



# ***WHEN I WENT OVER THE EDGE TO THE DARK SIDE ...***

**From:** Ostro, Stu

**Sent:** Monday, December 04, 2006 5:12 PM

**Subject:** RE: unprecedented December severe weather outbreak in the Northeast Friday

The amount of oddities (not just "extremes") – seems to continue to increase, and many of them can be directly related to stronger and warmer ridges (some transient, some persistent) and/or the feisty troughs that seem to be developing in response.

2006 reinforces to me something which I had decided by the end of 2005, which is that I can no longer accept the mantra of "individual weather events can't be connected to global warming," much less be the vocal proponent thereof as I used to.

I know that's sacrilege from the standpoint of what conventional wisdom considers to be sound science, but ... while one single event indeed does not demonstrate anything ... given the context with all the other things going on, if there had been any remaining reasonable doubt in my mind this severe convective outbreak has helped to further erase it.



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# THE “OSTRO HYPOTHESIS”

[As it has been dubbed by some colleagues]

- **The atmosphere has warmed**
- **One way that has manifested itself is by the thickness (depth) of layers of the atmosphere increasing**
- **That’s happening not only in the long-term averages, it’s also affecting short-term weather patterns and individual events by way of “ridges” of high pressure aloft and “troughs” of low pressure**
- **Which in turn is a key driver for the frequency and nature of recent weather extremes**

-The gist of this was originally posted as part of this:

-Not yet peer-reviewed, but am working on that with Jay and other collaborators.

September 27, 2007



**A Connection Between Global Warming and Weather**

Stu Ostro, Senior Meteorologist

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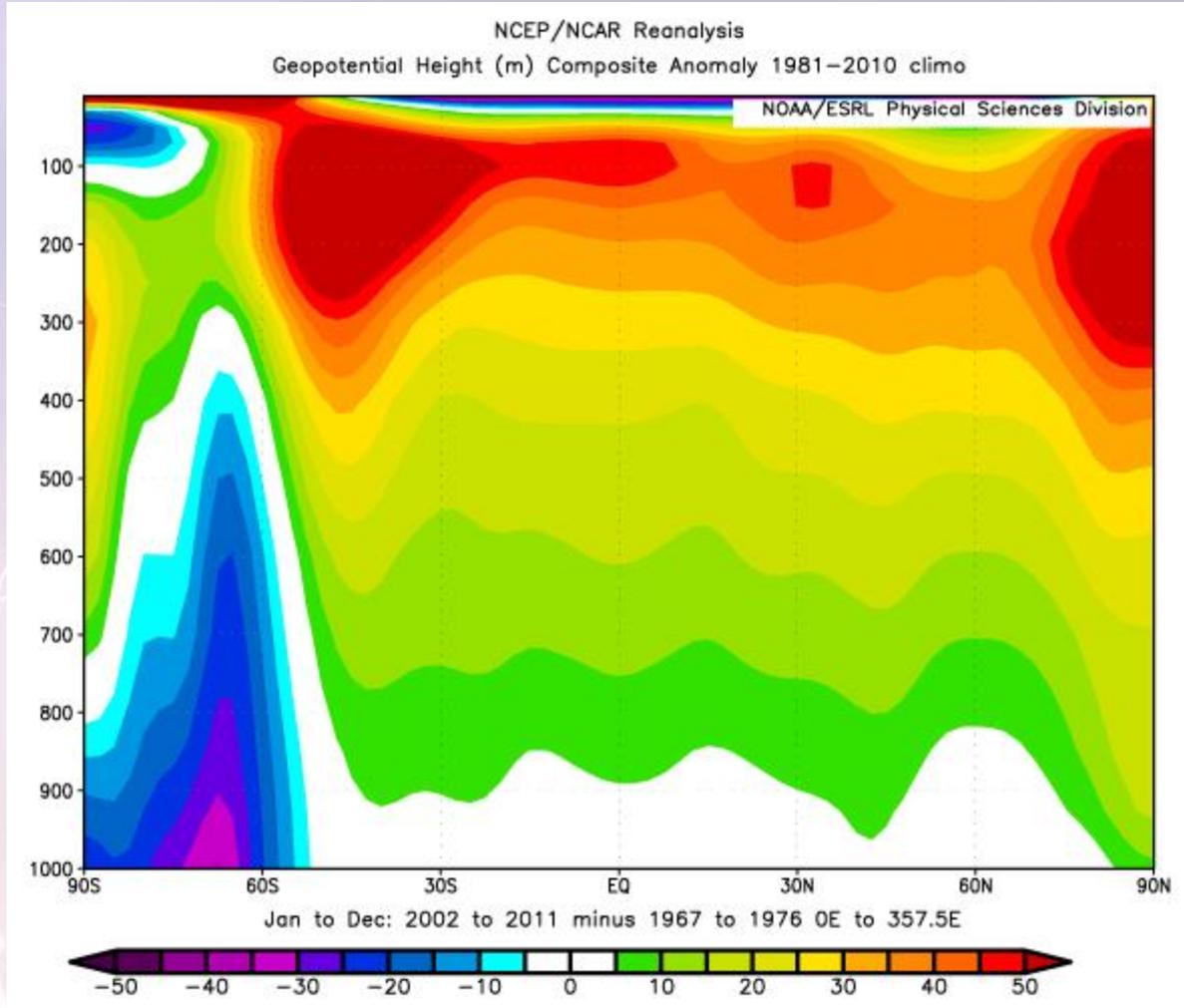
# RISING ATMOSPHERE



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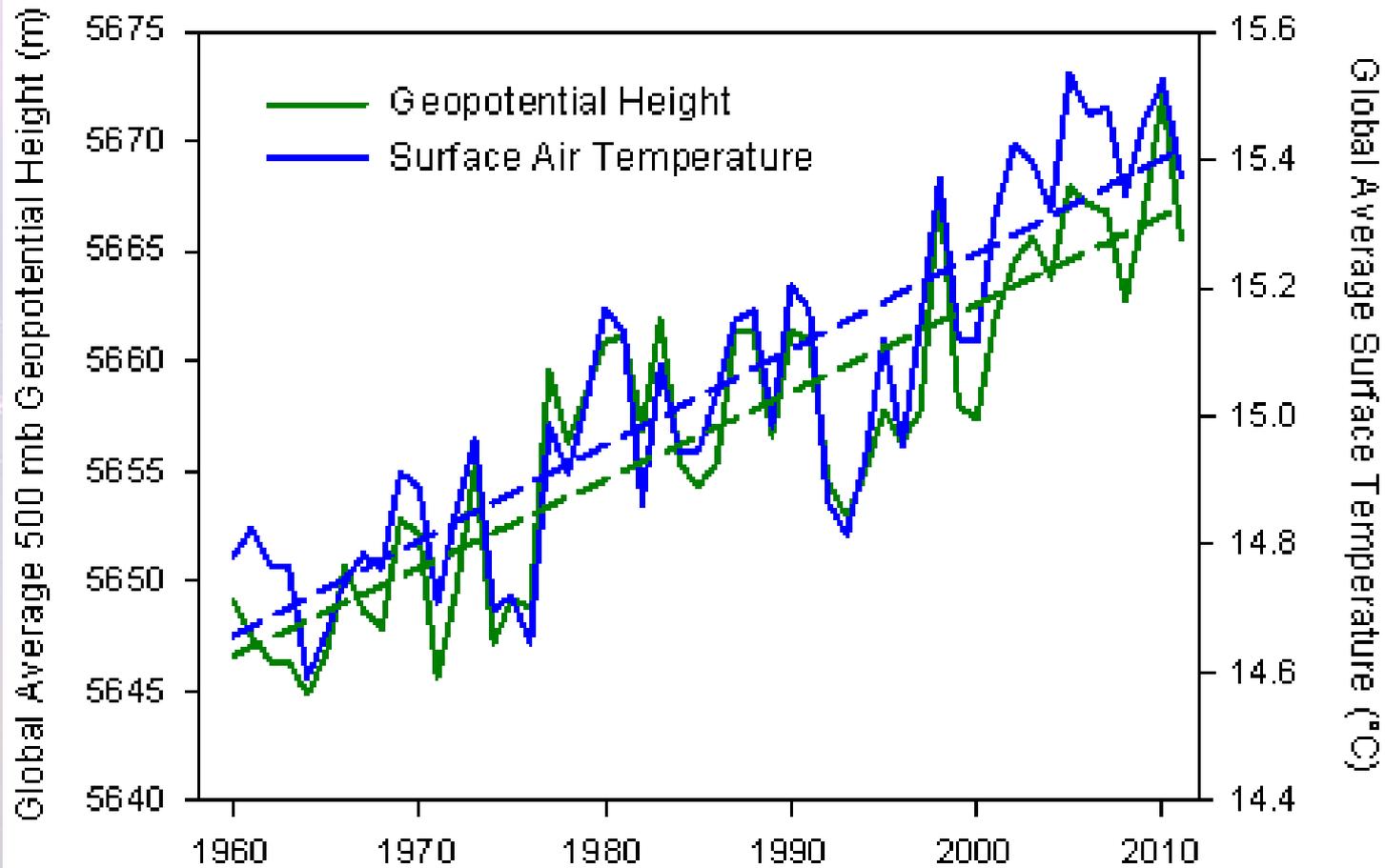
# RISING ATMOSPHERE



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# WARMING AND RISING



Analysis by Dan Huber, C2ES

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# ROMANIA



Image credit: criserb.com

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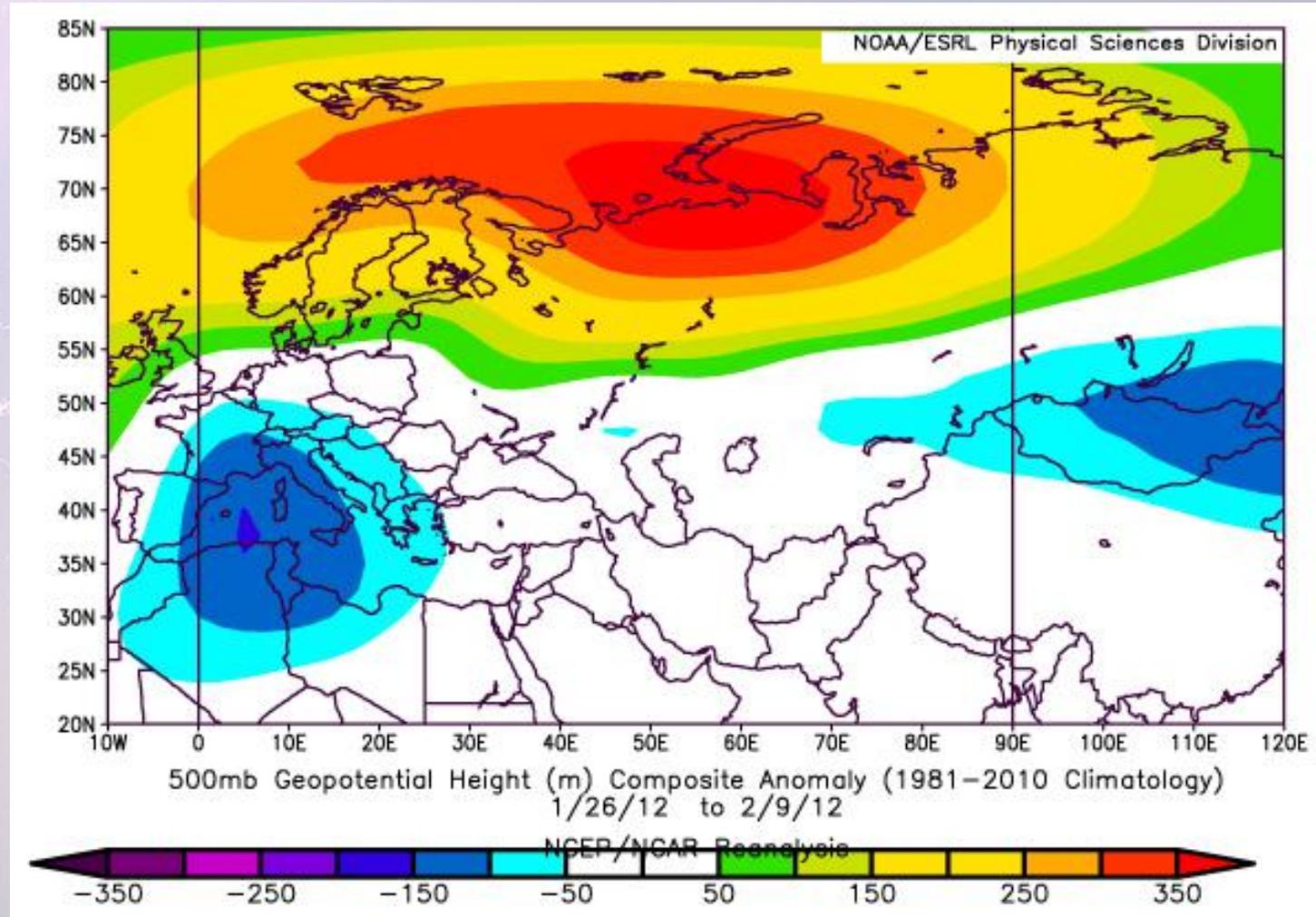


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# Global Warming Squishy Ball Bulge

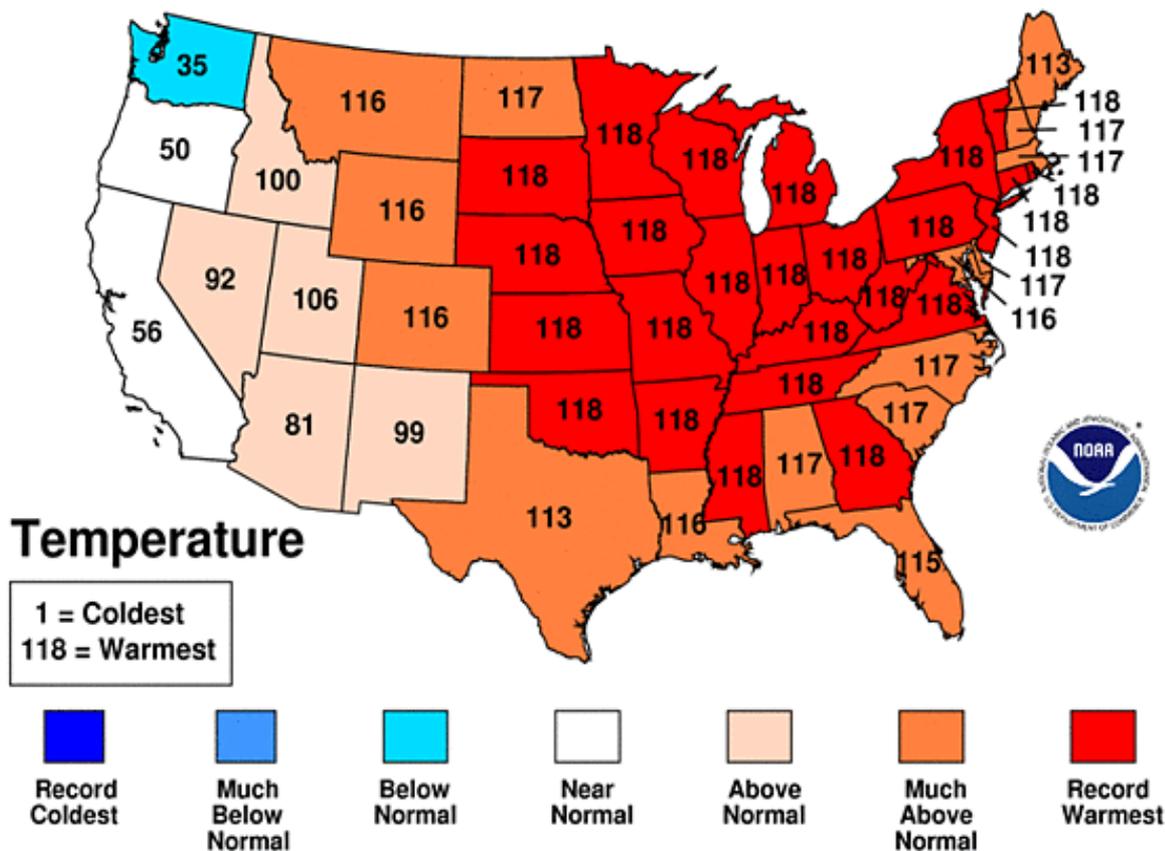


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# March 2012 Statewide Ranks

National Climatic Data Center/NESDIS/NOAA

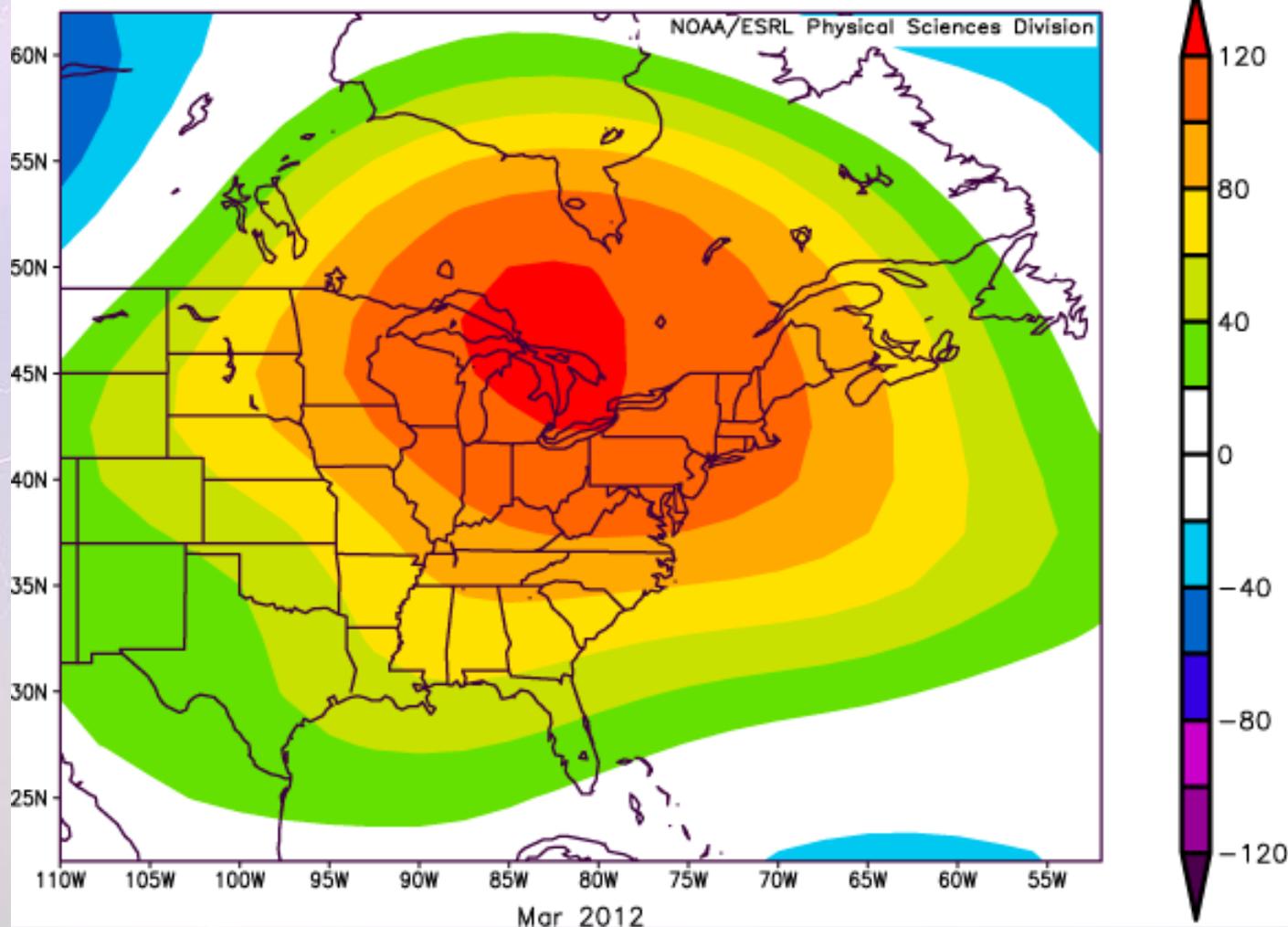


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NCEP/NCAR Reanalysis  
500mb Geopotential Height (m) Composite Anomaly 1981–2010 climo



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Stu Ostro, a senior Weather Channel meteorologist, told [msnbc.com](http://msnbc.com)

"It's not only what happened in March in North America," he said, "it's the *context*: the extremity of this extraordinary early-season heat in the U.S. and southern Canada, plus Norway and Scotland breaking their March high temperature records; Texas and Oklahoma in 2011 having their hottest summer on record, even hotter than during the Dust Bowl; the off-the-charts 2010 Russia heat wave along with approximately 20 countries setting high temperature records that summer; and Canada having its warmest winter and year on record in 2010."

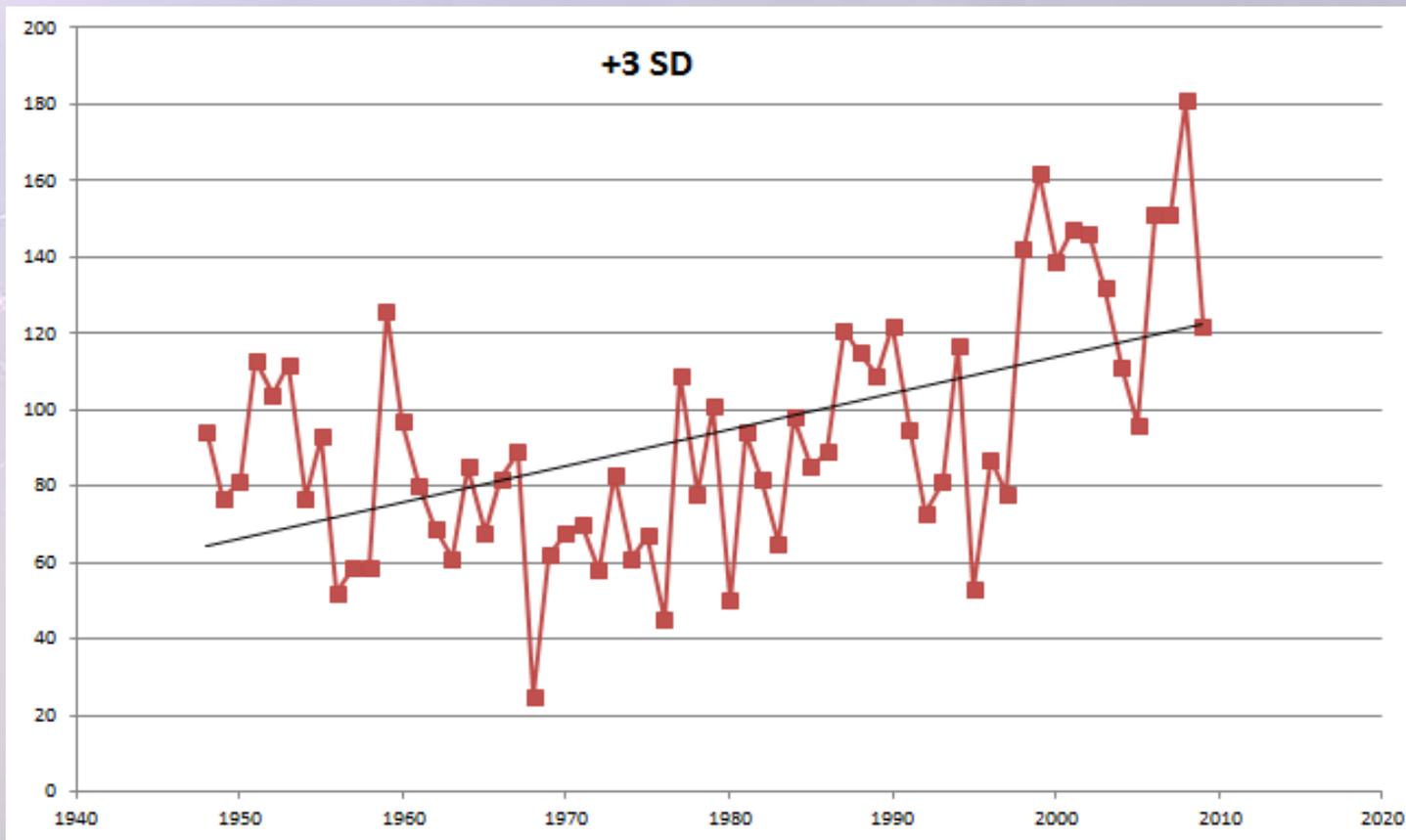
"All of this happening with such frequency," he added, "provides overwhelmingly convincing evidence that the overall increased warmth is making the atmosphere more conducive to these sorts of heat extremes."

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# CLIMATE CHANGE → WEATHER

## PRELIMINARY RESULTS: # OF DAYS AT 0-30N LATITUDE WITH EXCEPTIONALLY STRONG SQUISHY BALL BULGES



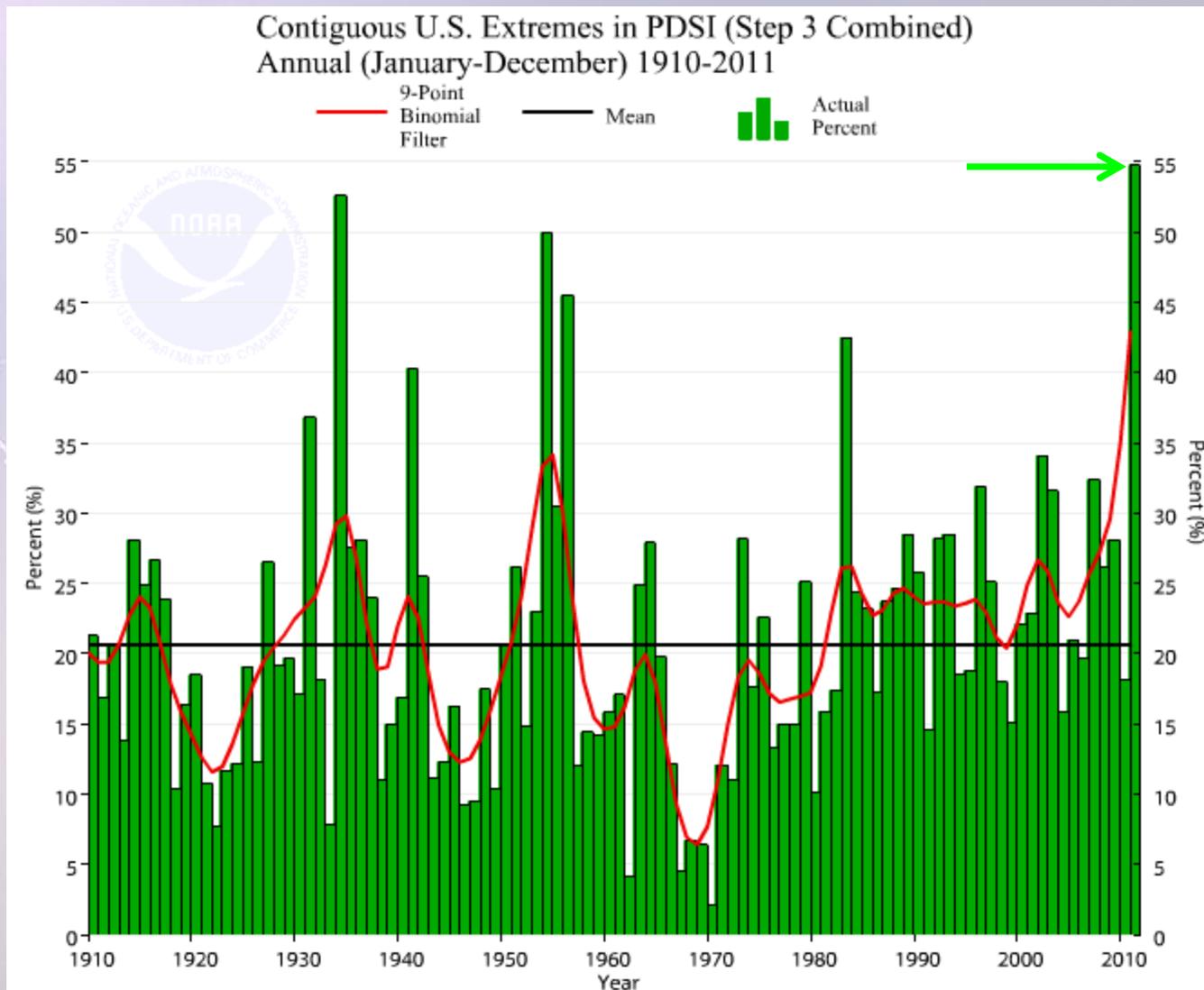
# UNUSUALLY FAR NORTH AND/OR INTENSE CONVECTIVE EVENTS FOR THE TIME OF YEAR

Since 1999

- January 21-22, 1999: Largest January tornado outbreak on record
- November 10, 2002: Van Wert F4
- November 5-6, 2005: Evansville - 25 fatalities
- November 12, 2005: Iowa
- November 15, 2005: Madisonville, KY F4
- November 24, 2005: F1 on Thanksgiving which was latest-in-year tornado on record in Maine
- November 15-16, 2006: Riegelwood, NC
- December 1, 2006: PA / NY / New England
- March 28, 2007: ~60 high Plains tornadoes as far north as western NE
- October 17-18, 2007: Oct. record # in one outbreak; F2s in northern MI
- January 7-8, 2008: Wisconsin EF3
- January 29, 2008: Widespread wind damage IN/IL/OH/KY/TN; killer EF2 IN
- February 5, 2008: Super Tuesday outbreak
- December 27-28, 2008: MO/IL etc.
- February 10-11, 2009: ~475 severe tstorm wind reports; OK EF4
- September 16, 2010: NYC tornadoes and macroburst
- October 23-27, 2010: ~900 severe reports, as far N as G. Lakes; Oct. record # torn in 1 day
- November 16-17, 2010: 1<sup>st</sup> Nov. predawn severe wind reports on record in NJ/NY
- November 22, 2010: First November tornado in Wisconsin in 39 years
- December 1, 2010: Severe tstorm wind reports as far north as NJ
- December 31, 2010: As far north as IL; biggest New Year's Eve day severe outbreak in modern database
- 2010: Minnesota - most tornadoes of any state this year [Not an individual event, and not time-of-year-specific, but of a similar theme of this slide]
- April 10, 2011: For so early in season in WI - most tornadoes in one day & farthest north [E]F2+
- November 7, 2011: 1<sup>st</sup> [E]F4 in OK in Nov. in official records going back to 1950; farthest west in OK in Nov in longer period
- November 14, 2011: Severe tstorm outbreak as far north as eastern Great Lakes; EF2 tornadoes near Buffalo
- November 16, 2011: Tornado outbreak up to Virginia; South Carolina's deadliest late autumn tornado in official database
- December 22, 2011: Farthest-north Georgia [E]F3+ December tornado
- January 17, 2012: Louisville NWS area's most prolific January tornado outbreak on record
- January 23, 2012: 1<sup>st</sup> January [E]F3+ tornado on record in Jefferson Co., AL (Birmingham's county)
- February 28 - March 3, 2012: at least 90 tornadoes, 16 killers, as far N as OH; OH EF4 2<sup>nd</sup> farthest N so early in season; 1<sup>st</sup> Feb tors on rec in Neb.
- March 9, 2012: Hail up to 3" in diameter reported in Hawaii - if verified, by far the largest on record there, though data period is short (15 yrs)
- March 12-13, 2012: Michigan's farthest N tor so early in season; record earliest-in-season report of 1+" hail in New England



# EXTREME WET/DRY IN U.S.

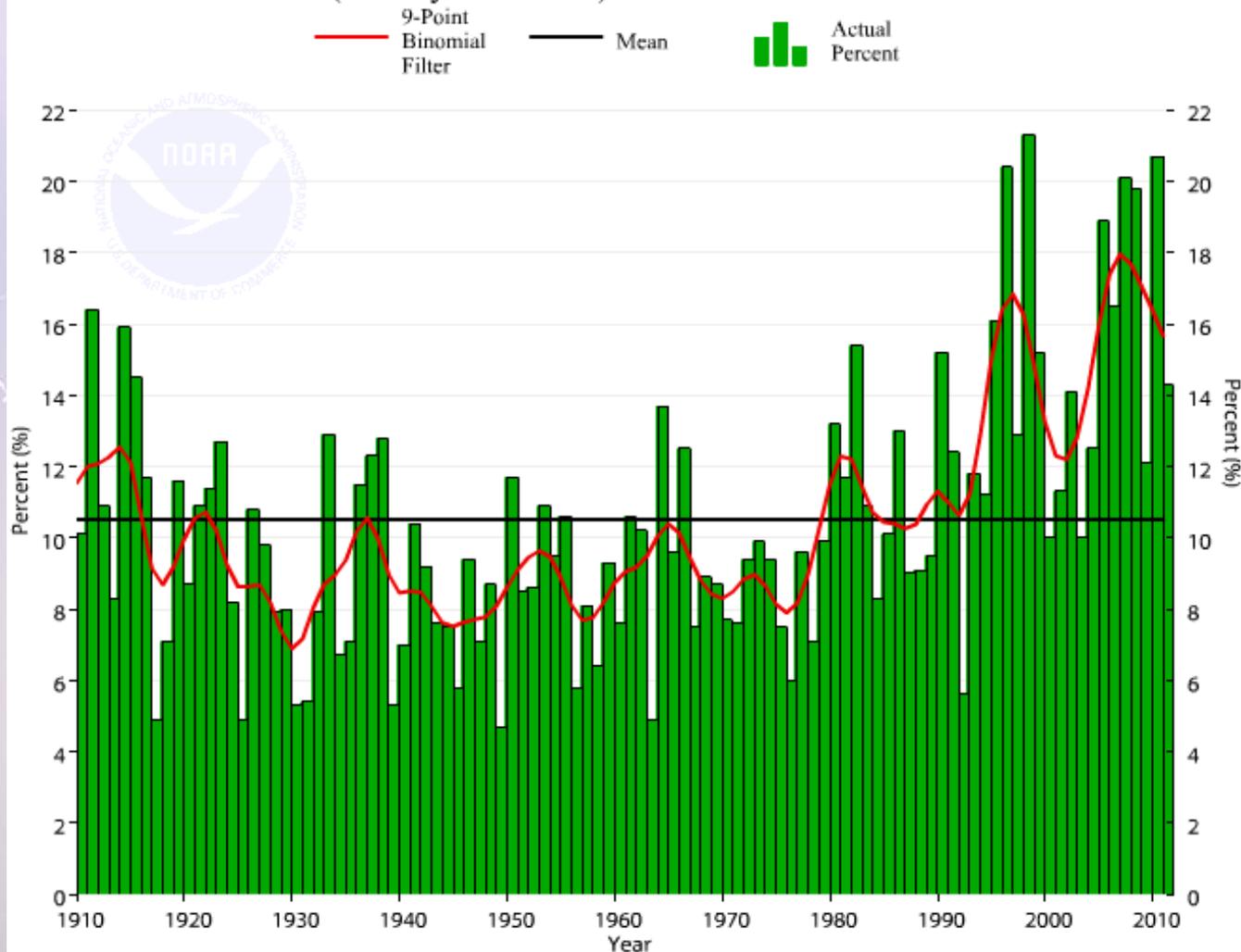


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# EXTREMES IN 1-DAY PRECIPITATION

Contiguous U.S. Extremes in 1-Day Precipitation (Step 4\*)  
Annual (January-December) 1910-2011

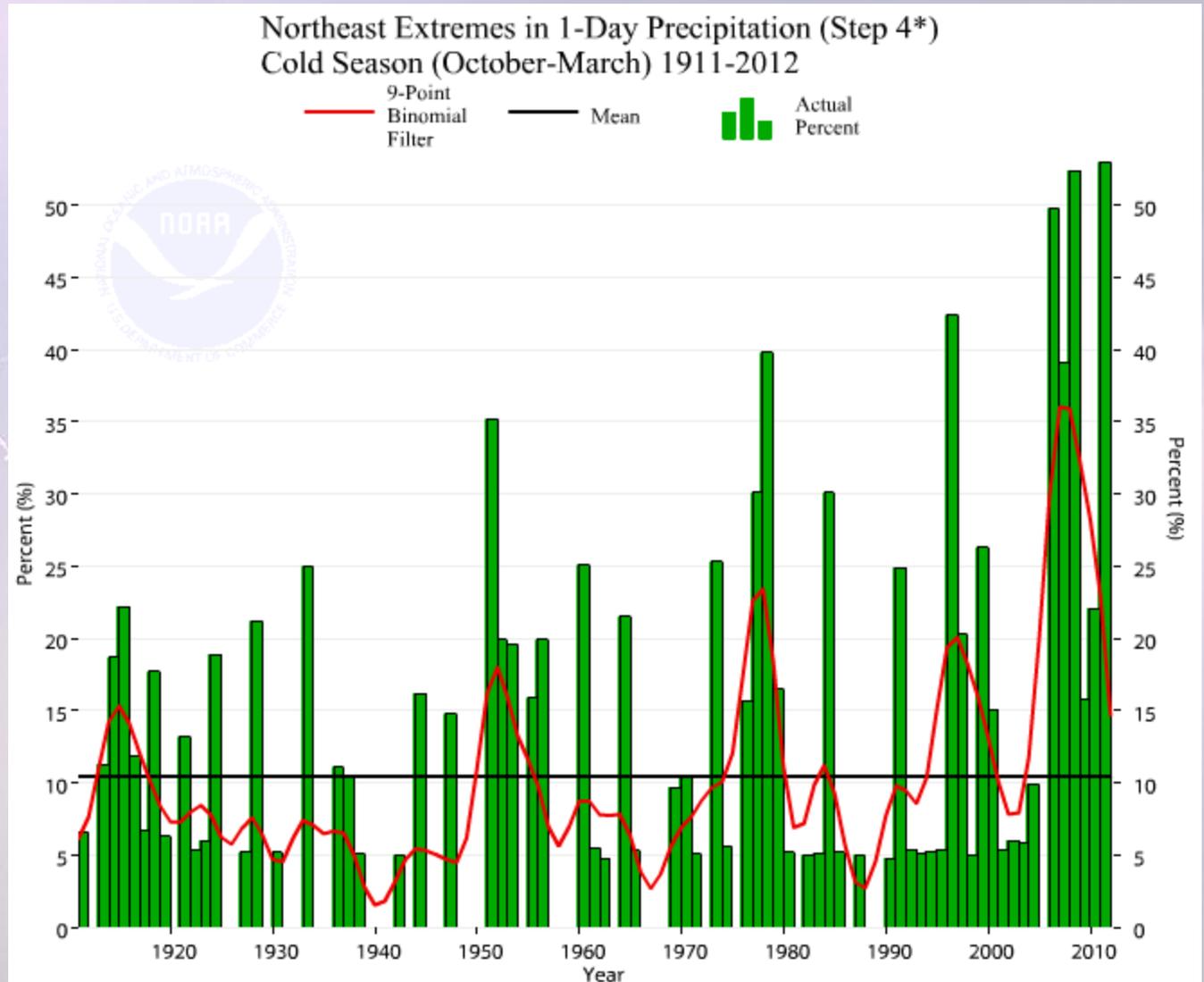


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# EXTREMES IN 1-DAY PRECIP

## “Cold Season” - Northeast



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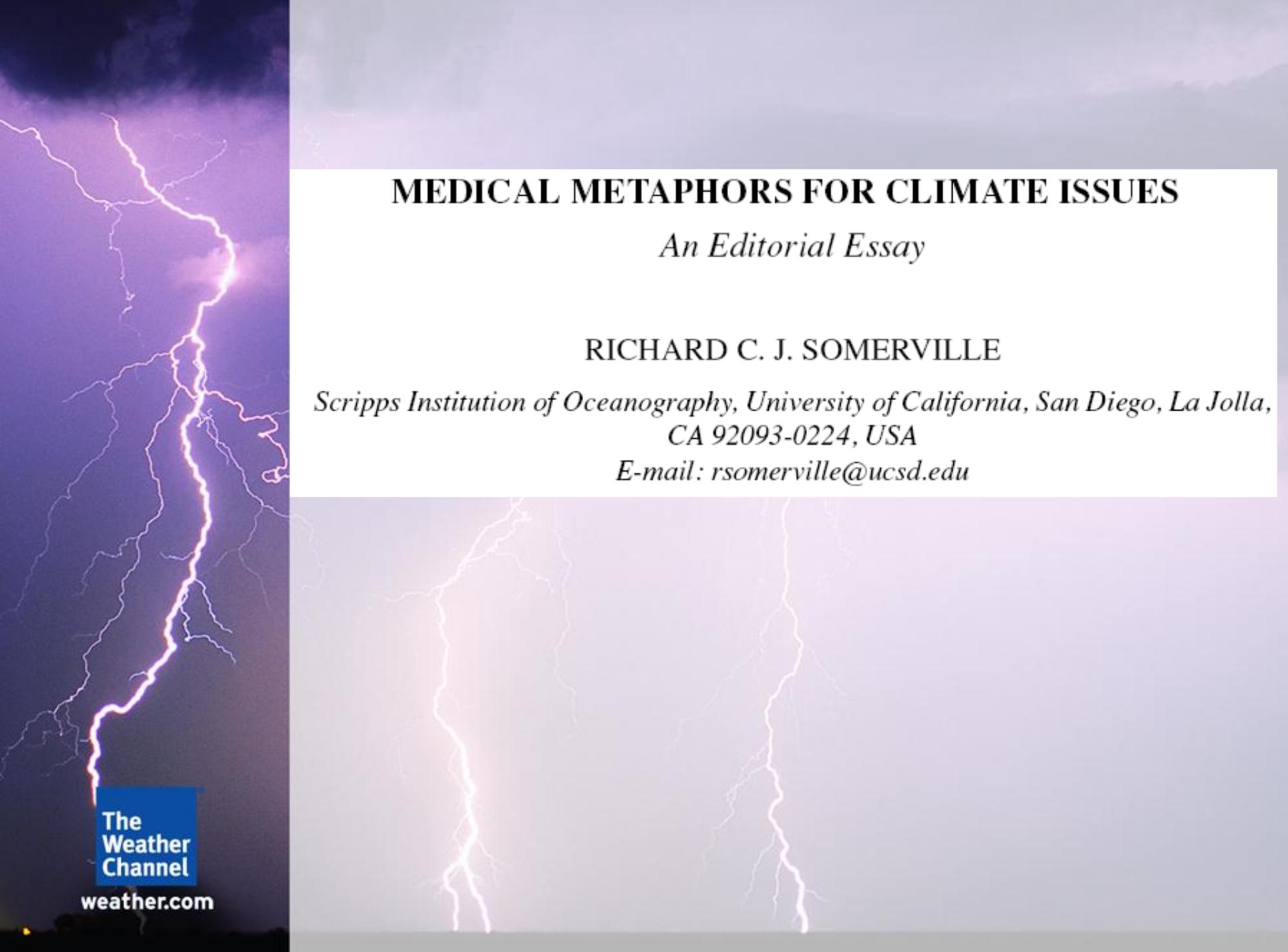
**FOR THE REST OF THE STORY ...**

[tinyurl.com/stuostro](http://tinyurl.com/stuostro)

**Slide 997**

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# **MEDICAL METAPHORS FOR CLIMATE ISSUES**

*An Editorial Essay*

**RICHARD C. J. SOMERVILLE**

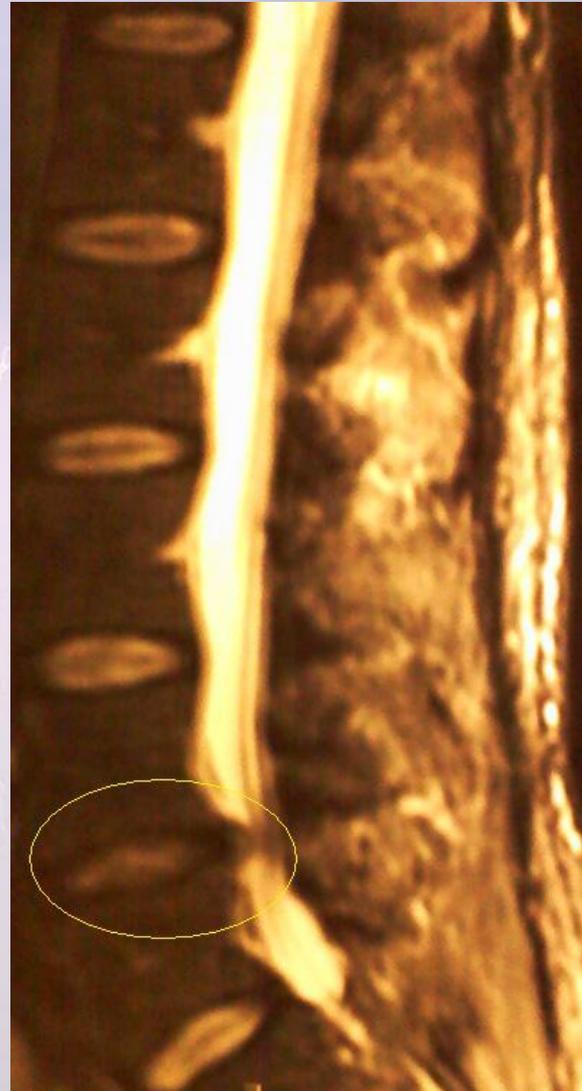
*Scripps Institution of Oceanography, University of California, San Diego, La Jolla,  
CA 92093-0224, USA*

*E-mail: [rsomerville@ucsd.edu](mailto:rsomerville@ucsd.edu)*

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# ***THE DISC HAS DEGENERATED***



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**December 16, 2008**



**Move On Up**

[Stu Ostro](#), Senior Meteorologist



Dr. Steven J. Ostro 1946-2008



**January 11, 2009**

**Detection of weather and cancer**

Something ain't right ...

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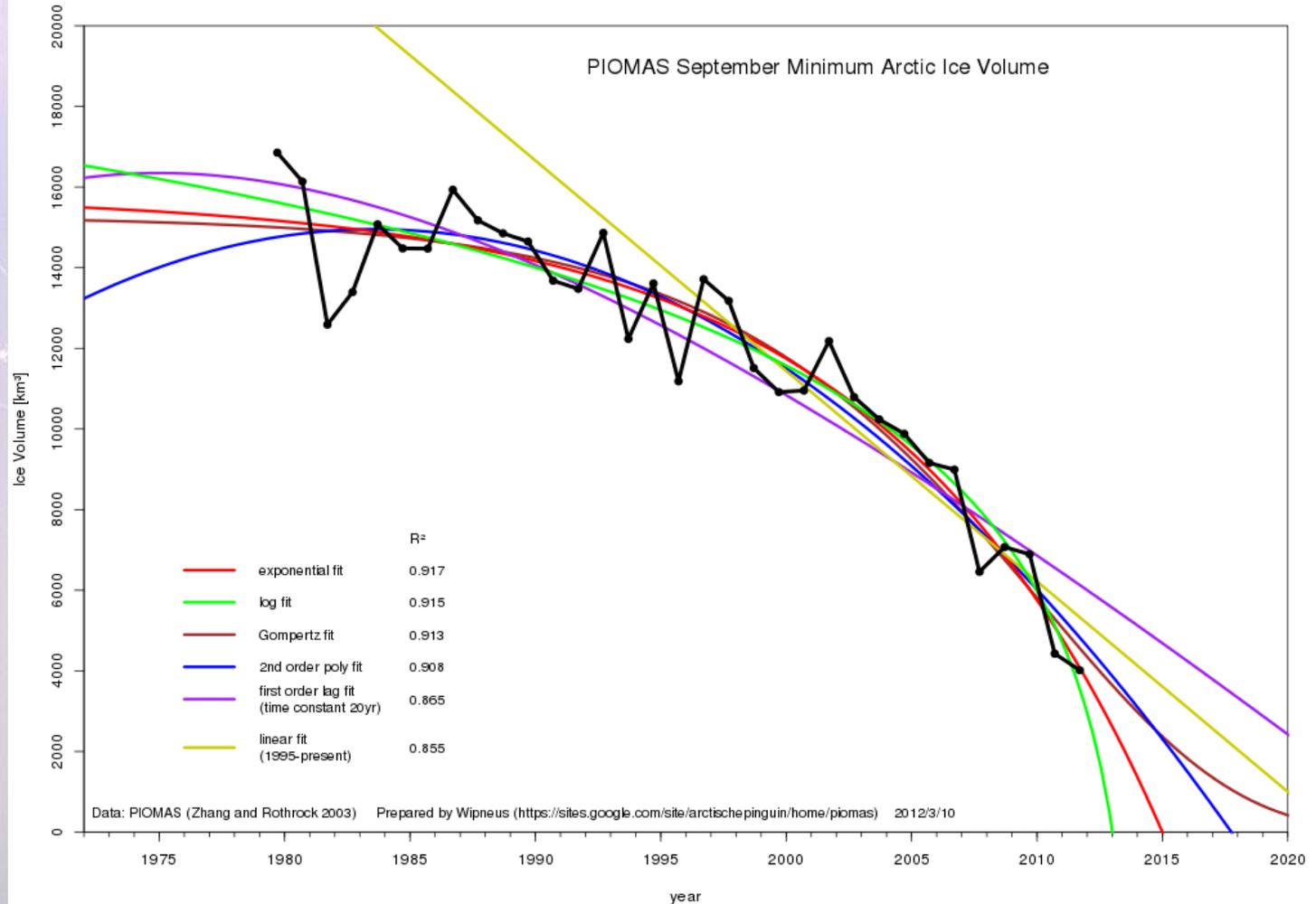
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**Weather-Ready Nation**

National Oceanic and Atmospheric Administration

# THE CLIMATE DISC HAS DEGENERATED



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# STU EMAIL EXCERPT

**I do not take any of this lightly.**

**I am putting my professional reputation on the line, as well as, by implication since I'm an employee even though I am speaking for myself, The Weather Channel's credibility.**

**I am confident enough overall in what I'm seeing to go out on the limbs that I have gone out on.**

**As a forecaster, I have an obligation to call 'em as I see 'em, and the same goes with what I'm observing in the changes in weather. On my last day on this planet, I need to not look back and think that I didn't do so.**

**I certainly don't have all the answers, and the climate-weather system is so complex that they will be difficult to find, but I hope to at least find some of them**

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# THANK YOU!

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